

Management of Pain in The Intensive Care Unit

Fatimah Abdulwahab Alhawaj¹, Zohair Radi Alghazal¹, Mohammed Saleh Alonazi², Nura Nasser Alahmadi³, Almutari Abdulkmajed⁴, Ali Mohammed Alhijab¹, Imtinan Abdulrahman Malawi⁵, Sohaib Osama Baarimah⁶, Abdulhadi Salem Towairqi⁷

1 Imam Abdulrahman Bin Faisal University, 2 Imam Muhammad Bin Saud University, 3 Taibah University, 4 Semmelweis University, 5 Batterjee Medical College, 6 Umm Al-Qura University, 7 University of Jeddah

Corresponding Author: Fatimah AbdulwahabAlhawaj – 00966546644766

ABSTRACT

Background: Pain assessment in ICU patients turns out to be a daily challenge for the attending teams, particularly in those patients who are intubated endotracheally; on mechanical ventilation or analgosedated as such patients are unable to self-assess existence and intensity of pain. Guidelines to identify pain in these patients are crucial for physicians for effective management.

Methodology: We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1994, through March 2017. The following search terms were used: pain management in ICU, pain in ICU, pain assessment by behavior, pain assessment in intubated patients.

Aim: Our aim in this study was to understand how to assess and manage pain in an intensive care unit patient, particularly those patients who are unable to self-report or assess.

Conclusion: Physical clues given by comatose or intubated patients in critical care unit must be used as a method to identify existence of pain, and must be managed effectively to decrease discomfort and prevent short and long term adverse effects.

Keywords: Intensive care unit pain assessment, ICU pain management, guidelines to pain management.

INTRODUCTION

Pain is defined by the International Association for Study of Pain (IASP) as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”^[1]. The description highlights that pain is of subjective nature, and also highlights that only the person experiencing the pain can assess its intensity. However, unfortunately, as many of the patients who are treated in intensive care units (ICUs), especially, those who are intubated and on mechanical ventilation, do not fit this definition as they are unable to self-report pain sensations nor assess the pain intensity. Pain assessment in ICU patients turns out to be a daily challenge for the attending teams, particularly in those patients who are intubated endotracheal, on mechanical ventilation or analgosedated. Adding to those challenges are other co-existing mental and neurological disorders such as psychoses, dementia, aphasia, critical condition-related delirium^[2].

METHODOLOGY

- Data Sources and Search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1992, through March 2017. The following search terms were used: pain management in ICU, pain in ICU, pain assessment by behavior, pain assessment in intubated patients

- Data Extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were resolved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

The study was done after approval of ethical board of King Abdulaziz University.

Incidence of pain in ICU patients

The World Health Organization (WHO) estimation show us that nearly 83% of the people in the world live in nations with either deprived access, or no access at all to pain management^[3]. However, pain experienced by patients of ICU is a common finding and is well documented. In the course of treatment in ICU, up to 40–70% of patients have experienced moderate to severe pain. According to some studies, around 30% of patients have

experienced pain at rest, and about 50% of patients reported pain during numerous nursing interventions [4]. A big number of patients who were discharged from an ICU recognize that the pain felt during the stay was a huge source of distress. Most of the patients were not able to verbally assess their pain because of reasons such as altered levels of consciousness in ICU, mechanical ventilation, and sedatives or relaxants given in high doses. The failure to communicate verbally does not rule out that a patient is not experiencing pain or is not in need of appropriate analgesic management. Consequently, the job of clinicians is to evaluate consistently the pain in patients with whatever limited opportunities of communication by assessing pain substitutes [5].

Types of Pain experienced by ICU patients

The pain that occurs at rest experienced by critically ill patients can be related to surgical procedures, burns, injuries, neoplastic diseases or therapeutic nursing-interventions. Pain, therefore, can be classified into four categories [6]:

- I. Continuous pain or discomfort that is associated with invasive procedures.
- II. Acute pain associated with an ongoing disease.
- III. Intermittent pain due to ICU procedures.
- IV. Chronic pain the patient has before ICU admission.

The subsequent procedures and interventions which can possibly result in pain or discomfort comprise changing patients' positions, suction of the oral cavity or bronchial tree, care of wound, drain removal or catheter insertion, intubation or intravenous accesses [7]. Further concerns includes continued long period of acute pain, which significantly worsens the quality of life of patients managed in ICUs, and also after discharge. The pain which is caused by ICU procedures is yet a vital matter in critically ill patients. It differs with age and sex, depends on the level of pain before interventions and, most essentially, is managed only in 25% of patients; and so, it needs distinctive attention and pre-emptive treatment [8].

Consequence of ICU Pain

The adverse physiological and psychological results associated with insufficient management of pain are chronic and particularly serious. It has been recognized for a long time that the many of the patients pinpoint the pain that they had experienced while being treated in ICU as a cause of sleep-related problems after getting discharged from the ICU [9]. The existing study findings show that up to 82% of patients discharged from ICU recall the pain or discomfort which was as a result of the presence of endotracheal tubes, while 77% remember unceasing moderate to severe pain. According to Granga *et al.*, [10] 17% of patients recall severe discomfort during ICU management that later lasts up to six months after discharge, while 18% show a high risk of post-traumatic stress disorder.

The stress response induced by pain can lead to tragic consequences, as well as amplified concentrations of catecholamine (nor-epinephrine and epinephrine), vasoconstriction, decreased tissue perfusion and impaired partial pressure of oxygen in the tissues. The other disorders activated by pain are hypermetabolism that results in hyperglycemia, lipolysis, or protein catabolism, leading to impaired wound healing. That up surges the risk of infections [8]. Pain causes immune system disorders by inhibiting the natural killer cell activity, decreasing the cytotoxic T-lymphocyte cell count and decreasing the phagocytic activity of neutrophils. Finally, acute pain felt by patients in several circumstances can be the crucial risk factor of chronic pain, such as neuropathic in nature [11].

Assessment of Pain in the ICU

The first step in the management of pain for those patients who are critically ill is the appropriate assessment. Self- reports of patients were found to be of the utmost importance in measuring pain for those patients [12]. Unfortunately, pain is tough to be assessed inside the ICU atmosphere because patients are frequently not able to communicate in words due to several reasons, for example, the severity of the current disease, the presence of an endotracheal tube, and sedating agents given to the patient. Assessment with the help of

physiological factors such as heart rate, arterial pressure, and respiration rate can be deceptive because they can be a manifestation of the underlying cause of admission, such as sepsis, hemorrhage, or hypoxia.^[13] Furthermore, it must be emphasized that changes in the basic vital parameters can only propose whether pain is present or not. There is a necessity to have an appropriate tool for its identification. Unfortunately, in the majority of studies dedicated to this topic, high arterial pressure or increased heart rate did not prove to be associated with the incidence of pain. Tachycardia and increased arterial pressure may both occur through painful and painless procedures. Besides, these parameters have shown no association with the patient's pain assessment and results of behavioral tests^[12]. As a result, such parameters must not be used as a basis for pain assessment with respect to occurrence and intensity in patients who are being treated in ICUs.

Management of Pain

The management of pain in the critically ill patients admitted in ICU is established on trustable and repeatable recording of intensity and monitoring of pain at a given time to assess the magnitude and level of interventions essential for treating it. The backbone of pain management is the patient's own self-assessment; therefore, self-assessment must

at all times be considered. The patients are involved in deciding the level of intensity of pain. The best method to measure pain are the ones based on patient's self-assessment, for example, the visual analogue scale (VAS)^[14]. On another scale called the numeric rating scale (NRS), which, however, assume patient-caregiver collaboration can be used^[15]. Further problems arise due to the effects of sedation, delirium, the treatment options of delirium, and other issues that interfere with the central nervous system. It is important to understand that even the best tool may be unsuitable for some groups of patients, which include children, patients who are unable to verbally communicate, patients with dementia, and patients with other mental illness. As we see many patients are incapable of self-assessment

of pain due to the above mentioned factors, some other methods have been formulated. They are based on clinical observation done by physicians and nurses about the condition of patients^[16].

The authors of the PAD (Pain, Agitation, and Delirium) from Society of Critical Care Management (SCCM) guidelines of 2013 investigated six behavioral pain scales (BPS): BPS-non-intubated, Critical Care Pain Observation Tool (CPOT), and the Non-verbal Pain Scale (NVPS), the Pain Behavioral Assessment Tool (PBAT) and the Pain assessment Intervention and Notation (PAIN) algorithm^[17]. In the opinion of the authors, the most trustable and best authenticated behavioral scales in patients who are unable to report pain by themselves are the BPS and CPOT. The family of the patient is of extreme significance for assessment of pain in ICU patients; the family recognizes the pain-related behaviors much faster and must be engaged in the assessment. Both the BPS and CPOT are convenient to use and as a result are manageable for members of family^[13].

Critical Care Pain Observation Tool (CPOT):

The CPOT was designed by Gelinas *et al.*^[18] in the French language and soon after that was translated into and authenticated in other languages. The assessment was intended to perceive pain in critically ill patients and includes four behavioral categories - facial expressions, body movements, muscle tension, compliance with a ventilator in case of an intubated patient verbalization in case of an extubated patient. Every category is counted on a scale of 0–2 (in a total of 0–8 points). According to the data described, the cut-off point is 2–3, whereas a score of > 2 points out the existence of pain. The scale is a decent tool in order to distinguish between pain-related procedures such as the variations in body position, and painless procedures like non-invasive arterial pressure measurement ($P \leq 0.001$)^[18].

[Table 1]

Table 1: Critical Care Pain Observation Tool (CPOT)

Indicator	Description	Interpretation	score
Facial expression	-no muscle observed	- Relaxed	0
	-frowning, brow lowering, orbit tightening, other changes (eye opening, tearing)	- Tense	1
	-all above facial movements plus eyelids tightly closed or biting endotracheal tube)	- grimacing	2
Body movements	-No movement or normal position	- relaxed	0
	-slow, cautious movement, attempting to touch pain site, attention seeking movements	- protection	1
	-pulling tube, attempting to sit-up, striking staff, trying to climb out of bed	- agitation	2
Muscle tension	-No resistance to passive movements	-relaxed	0
	-resistance to passive movements	-tense, rigid	1
	-strong resistance	-Very tense or rigid	2
Compliance with ventilator or vocalization	-easy ventilation, no active alarms	-Tolerating ventilator	0
	-alarms may be active, coughing but stops spontaneously	-coughing but tolerating ventilator	1
	-sighing, moaning, crying out	-fighting ventilator	2
Total			0-8

Behavioral Pain Scale (BPS):

The BPS was designed by Paten *et al.*^[19] in order to measure pain in unconscious, mechanically ventilated patients. The scale is founded on three types depending on ranges of behavior:

- 1) facial expressions,
- 2) movements of the upper extremities and
- 3) compliance with a ventilator

The family or physician scores each of these ranges. The total score differs from 3 (which indicate no pain) to 12 (severe pain). The accessible study outcomes reveal that the BPS has worthy psychometric properties (Cronbach's α 0.64–0.79) and moderate to high indices of family-staff agreement ($\kappa = 0.67$ –0.89; [ICC] = 0.58–0.95).[Table 2]

Table 2: Behavioral Pain Scale (BPS)

Item	Description	Score
Facial expression	-relaxed -partially tightened -fully tightened -grimace	1 2 3 4
Upper limb movements	-no movement -partially bent -fully bent with finger flexion -permanently retracted	1 2 3 4
Compliance with mechanical ventilation	-tolerating movement -coughing but tolerating -fighting ventilator -unable to control ventilation	1 2 3 4

Medications Used to Treat Pain in the ICU

Opioids which include fentanyl, methadone, morphine, hydromorphone, and remifentanil, are the principal medications for treatment of pain in the critically ill patients residing in ICU^[20]. The ideal selection of opioid and the dosing schedule which is used for an individual patient of ICU relies on many elements, together with the drug's pharmacodynamics and pharmacokinetic properties. The consumption of meperidine is commonly avoided in ICU patients due to its possibility for neurologic toxicity. A number of other types of analgesics or pain-modulating drugs, for example the local and regional anesthetics like bupivacaine; or non-steroidal anti-inflammatory medications such as ketorolac, ibuprofen; intravenous acetaminophen; and anti-convulsants, may be given as adjunctive pain medications to decrease opioid requirements and lessen dependence^[21].

Intravenous acetaminophen has been lately accepted for use in the United States and has proven to be harmless and effective when used in combination with opioids, especially for post-operative pain in patients admitted in surgical ICU subsequent to major surgeries like cardiac surgery^[22]. Neuropathic pain which unfortunately is poorly handled with opioids unaided can be managed when administered per-enteral with gabapentin and carbamazepine in ICU patients, provided they have sufficient gastrointestinal absorption as well as motility. Enteral route of administration of opioids as well as other pain medications would be limited particularly to patients with sufficient

gastrointestinal absorptive ability and motility. Regional or neuraxial which includes spinal or epidural modalities may as well be used for post-operative pain relief after a number of surgical procedures^[23]. On the other hand, non-pharmacologic interventions are also used for pain management. Examples include music therapy, massage, and relaxation techniques, may benefit as opioid-sparing and analgesia-enhancing. Interestingly, they are low cost, economic, safe, and easy to provide^[24].

CONCLUSION

Pain suffered by patient in the ICU is not an uncommon phenomenon. It could be due to the underlying cause or due to the procedures they undergo during the management. As many patients are unable to verbalize or report pain, physical clues given by comatose or intubated patients in critical care unit must be used as a method to identify existence of pain. These clues can be used to notice the intensity of pain as well. The physicians and other staff working with such patients must be made aware of such guidelines. It is important to provide relief effectively in order to decrease discomfort and prevent short and long term adverse effects, as well as, improve the quality of life.

REFERENCES

1. IASP Taxonomy - IASP (1994): Definition of Pain Terms. <https://www.iasp-pain.org/Taxonomy>
2. Hajiesmaeli MR and Safari S(2012): Pain management in the intensive care unit: do we need special protocols? Anesth Pain Med., 1: 237-238.

- 3.WHO(2012):** WHO Guidelines on the Pharmacological Treatment of Persisting Pain in Children with Medical Illnesses. Geneva. http://www.who.int/medicines/areas/quality_safety/children_persisting_pain/
- 4. Skrobik Y and Chanques G(2013):** The pain, agitation, and delirium practice guidelines for adult critically ill patients: a post-publication perspective. Ann Intensive Care, 3: 9.
- 5.Pudas-Tahka SM, Axelini A, Aantaa R, Lund V and Salanterä S(2009):** Pain assessment tools for unconscious or sedated intensive care patients: a systematic review. J Adv Nurs., 65: 946-956.
- 6.Baumbach P, Gotz T, Gunther A, Weiss T and Meissner W(2016):** Prevalence and Characteristics of Chronic Intensive Care-Related Pain: The Role of Severe Sepsis and Septic Shock. Crit Care Med., 44: 1129-1137.
- 7.Puntillo KA et al.(2014):** Determinants of procedural pain intensity in the intensive care unit. The Europain(R) study. Am J Respir Crit Care Med., 189: 39-47.
- 8. Georgiou E, Hadjibalassi M, Lambrinou E, Andreou P and Papathanassoglou ED(2015):** The Impact of Pain Assessment on Critically Ill Patients' Outcomes: A Systematic Review. Biomed Res Int., DOI: 10.1155/2015/503830.
- 9.Puntillo KA, Max A, Chaize M, Chanques G and Azoulay E(2016):** Patient Recollection of ICU Procedural Pain and Post ICU Burden: The Memory Study. Crit Care Med., 44: 1988-1995.
- 10.Granja C et al.(2005):** Patients' recollections of experiences in the intensive care unit may affect their quality of life. Crit Care, 9: 96-109.
- 11.Freye E and Latasch L(2003):** Development of opioid tolerance -- molecular mechanisms and clinical consequences. Anesthesiol Intensivmed., 38: 14-26.
- 12.Morandi Aet al.(2017):** Worldwide Survey of the "Assessing Pain, Both Spontaneous Awakening and Breathing Trials, Choice of Drugs, Delirium Monitoring/Management, Early Exercise/Mobility, and Family Empowerment" (ABCDEF) Bundle. Crit Care Med., doi: 10.1097/CCM.0000000000002640.
- 13.Kotfis K, Zegan-Baranska M, Szydlowski L, Zukowski M and Ely WE(2017):** Methods of pain assessment in adult intensive care unit patients - Polish version of the CPOT (Critical Care Pain Observation Tool) and BPS (Behavioral Pain Scale). Anaesthesiol Intensive Ther., 49: 66-72.
- 14.Breivik H(2016):** Fifty years on the Visual Analogue Scale (VAS) for pain-intensity is still good for acute pain. But multidimensional assessment is needed for chronic pain. Scand J Pain, 11: 150-152.
- 15.Lee JJ et al.(2015):** Pain relief scale is more highly correlated with numerical rating scale than with visual analogue scale in chronic pain patients. Pain Physician, 18: E195-200.
- 16.Ayasrah SM, O'Neill TM, Abdalrahim MS, Sutary MM and Kharabsheh MS(2014):** Pain Assessment and Management in Critically ill Intubated Patients in Jordan: A Prospective Study. Int J Health Sci (Qassim), 8: 287-298.
- 17.Barr Jet al.(2013):** Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. Crit Care Med., 41: 263-306.
- 18.Gelinas C, Fillion L, Puntillo KA, Viens C and Fortier M(2006):** Validation of the critical-care pain observation tool in adult patients. Am J Crit Care, 15: 420-427.
- 19.Payen JF et al.(2001):** Assessing pain in critically ill sedated patients by using a behavioral pain scale. Crit Care Med., 29: 2258-2263.
- 20.Ehieli E, Yalamuri S, Brudney CS and Pyati S(2017):** Analgesia in the surgical intensive care unit. Postgrad Med J., 93: 38-45.
- 21.Jefferies S, Saxena M and Young P(2012):** Paracetamol in critical illness: a review. Crit Care Resusc., 14: 74-80.
- 22. Mahshidfar B et al.(2016):** Can intravenous acetaminophen reduce the needs to more opioids to control pain in intubated patients? Indian J Crit Care Med., 20: 465-468.
- 23.Zgaga AOet al.(2017):** Improvement of recovery parameters using patient-controlled epidural analgesia after oncological surgery. A prospective, randomized single center study. Rom J Anaesth Intensive Care, 24: 29-36.
- 24.Ames N et al.(2017):** Music Listening Among Postoperative Patients in the Intensive Care Unit: A Randomized Controlled Trial with Mixed-Methods Analysis. Integr Med Insights, DOI: 10.1177/1178633717716455.